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**NORTH ATLANTIC TREATY ORGANIZATION
ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD**

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18 September 2002

NSA/0910-SILCEP/3149

See Distribution List: STANAG AC/112 (NFLWG)

**STANAG 3149 SILCEP (EDITION 8) – MINIMUM QUALITY SURVEILLANCE OF
PETROLEUM PRODUCTS**

References: (a) MAS(AIR)164-F&L/3149, dated 30 April 1993 (Edition 7)
(b) LOG/SUPP.P(99)208/3149, dated 30 June 1999 (Edition 8)
(Ratification Draft 1)
(c) LOG/FUELS(02)52, dated 21 March 2002 (Edition 8) (Revised Draft)

1. The enclosed NATO Standardisation Agreement which has been ratified by nations as reflected in page iii is promulgated herewith.
2. The above references are to be destroyed in accordance with the local document destruction procedures.
3. AAP-4 should be amended to reflect the latest status of the STANAG.

ACTION BY NATIONAL STAFFS

4. National staffs are requested to examine page iii of the STANAG and, if they have not already done so, advise the Chairman, NATO Pipeline Committee (AC/112) of their intention regarding its ratification and implementation.



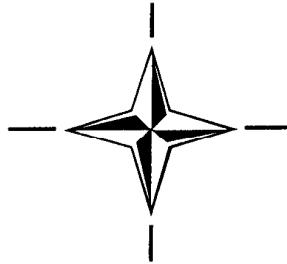
Jan H. ERIKSEN
Rear Admiral, NONA
Director, NSA

Enclosure:
STANAG 3149 (Edition 8)

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-1-

**NORTH ATLANTIC TREATY ORGANISATION
(NATO)**



**NATO STANDARDIZATION AGENCY
(NSA)**

**STANDARDIZATION AGREEMENT
(STANAG)**

SUBJECT: MINIMUM QUALITY SURVEILLANCE OF PETROLEUM PRODUCTS

Promulgated on 18 September 2002

A handwritten signature in black ink, appearing to read 'Jan H ERIKSEN'.

Jan H ERIKSEN
Rear Admiral, NONA
Director, NSA

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STANAG 3149
(Edition 8)

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Director, NSA under the authority vested in him by the NATO Military Committee.
2. No departure may be made from the agreement without consultation with the tasking authority. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.
3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

DEFINITIONS

4. Ratification is "In NATO Standardization, the fulfilment by which a member nation formally accepts, with or without reservation, the content of a Standardization Agreement" (AAP-6).
5. Implementation is "In NATO Standardization, the fulfilment by a member nation of its obligations as specified in a Standardization Agreement" (AAP-6).
6. Reservation is "In NATO Standardization, the stated qualification by a member nation that describes the part of a Standardization Agreement that it will not implement or will implement only with limitations" (AAP-6).

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

7. Page iii gives the details of ratification and implementation of this agreement. If no details are shown it signifies that the nation has not yet notified the tasking authority of its intentions. Page iv (and subsequent) gives details of reservations and proprietary rights that have been stated.

FEEDBACK

8. Any comments concerning this publication should be directed to NATO/NSA - Bvd Leopold III, 1110 Brussels – BE

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Agreed English/French texts

STANAG 3149
(Edition 8)
NAVY/ARMY/AIR

NATO STANDARDIZATION AGREEMENT (STANAG)

MINIMUM QUALITY SURVEILLANCE OF PETROLEUM PRODUCTS

Annexes:

- A. Minimum Common Requirements.
- B. Aviation Petroleum Products.
- C. Naval Petroleum Products.
- D. Army Petroleum Products.

Related Documents:

STANAG 1110 SILCEP-	ALLOWABLE DETERIORATION LIMITS FOR NATO ARMED FORCES FUELS, LUBRICANTS AND ASSOCIATED PRODUCTS.
STANAG 1135 SILCEP-	INTERCHANGEABILITY OF FUELS, LUBRICANTS AND ASSOCIATED PRODUCTS USED BY THE ARMED FORCES OF THE NORTH ATLANTIC TREATY NATIONS.
STANAG 3390 SILCEP-	INSPECTION STANDARDS FOR FUEL SOLUBLE CORROSION INHIBITORS/LUBRICITY IMPROVERS.
STANAG 3583 SILCEP-	STANDARDS OF ACCURACY FOR DIFFERENTIAL PRESSURE GAUGES FOR AVIATION FUEL FILTERS AND FILTER SEPARATOR VESSELS.
STANAG 3609 SILCEP-	STANDARDS FOR MAINTENANCE OF FIXED AVIATION FUEL RECEIPT, STORAGE AND DISPENSING SYSTEMS.
STANAG 3713 SILCEP-	DETERMINATION OF PARTICULATE MATTER IN AEROSPACE HYDRAULIC FLUIDS USING A PARTICLE SIZE ANALYSER.
STANAG 3967 SILCEP-	DESIGN AND PERFORMANCE REQUIREMENTS FOR AVIATION FUEL FILTER SEPARATOR VESSELS AND COALESCER AND SEPARATOR ELEMENTS.
STANAG 4362 SILCEP-	FUELS FOR FUTURE GROUND EQUIPMENTS USING COMPRESSION IGNITION OR TURBINE ENGINES.
STANAG 7036 SILCEP -	FUELS TO BE INTRODUCED INTO AND DELIVERED BY THE NATO PIPELINE SYSTEM (NPS).
STANAG 7063 SILCEP -	METHODS OF DETECTION AND TREATMENT OF FUELS CONTAMINATED BY MICRO-ORGANISMS
STANAG 7101 SILCEP -	GUIDE SPECIFICATIONS FOR GREASES
AFLP-6	PROCEDURES FOR THE TREATMENT OF FUELS CONTAMINATED BY MICRO-ORGANISMS

AIM

1. The aim of this agreement is to set out the minimum quality surveillance measures for petroleum products used by NATO Armed Forces in peace, crisis and conflict.

AGREEMENT

2. Participating nations agree the procedures in Annexes A to D.

IMPLEMENTATION OF THE AGREEMENT

3. This STANAG is implemented when a nation has issued necessary, orders/instructions to the forces concerned, putting the procedures detailed herein into effect.

NATO/EAPC UNCLASSIFIED

ANNEX A to
STANAG 3149
(Edition 8)

MINIMUM COMMON REQUIREMENTS

CONTENTS

	<u>PARAGRAPH No</u>
<u>GENERAL</u>	
Training of Personnel	1
Specifications	2
Qualification Testing	3
Procurement of Source Inspection	4
Conditions of Use of NATO Markings	5-6
Packaging, Marking and Identification	7
<u>BULK TRANSPORTATION</u>	
Single Fuel Concept	8
Pipelines	9-12
Waterborne Transport	13-16
Rail and Road Transport	17
Bulk Storage	18-26
Packed Stocks	27-30
Minimum Container Markings for Packed Petroleum Products	31-33
Minimum Sampling and Test Requirements (Including Fuels Handled in the NATO Pipeline System)	34
	<u>PAGE</u>
TABLE A-I - MINIMUM SAMPLING AND TESTING REQUIREMENTS FOR PETROLEUM PRODUCTS (INCLUDING FUELS HANDLED IN THE NATO PIPELINE SYSTEMS)	A-10-A-12
TABLE A-II - TESTS REQUIRED ON TURBINE ENGINE FUEL AVIATION (F-34, F-35, F-37, F-40, F-44)	A-13
TABLE A-III - TESTS REQUIRED ON GASOLINE AUTOMOTIVE (F-57, F-67)	A-14
TABLE A-IV - TESTS REQUIRED ON DIESEL FUELS (F-54, F-63, F-65, F-75, F-76) AND KEROSENE (F-58)	A-15
TABLE A-V - TESTS REQUIRED ON FUEL OIL(F-77)	A-16
TABLE A-VI - QUALITY SURVEILLANCE PROCEDURE FOR CHANGE OF GRADE OF WHITE (CLEAN) PRODUCTS, IN STORAGE TANKS, RAILCARS, ROAD TANK VEHICLES AND REFUELLERS	A-17

MINIMUM COMMON REQUIREMENTS

GENERAL

1. Training of Personnel. All personnel required for the handling of petroleum products are to be suitably trained to ensure that they are fully competent to perform their duties.
2. Specifications. The national specifications given at Annex C to STANAG 1135 set out the quality requirements of any product upon procurement.
3. Qualification Testing. Before a nation accepts any product on which qualification testing is required it is necessary for that nation to ensure that the qualification tests are performed, officially or under official supervision. In the case of imported products, each nation is to ensure that the product has received qualification by the nation of origin. The general characteristics obtained during qualification shall be available, on request, for subsequent identification of the product so that results obtained during quality control may be compared with them.
4. Procurement or Source Inspection. An officially designated laboratory capable of carrying out full specification testing of petroleum products by the approved methods, is to be located in, or available to, each NATO nation, and be available to the Service inspection authority. Products shall not be accepted unless approved by the cognizant national inspecting authority in accordance with that nation's regulations. Contractors supplying petroleum products shall, as a minimum requirement, meet ISO 9002. Nations having contracts for petroleum products outside their own country, will be responsible for the provision of adequate procurement inspection, either by themselves or by a cross-servicing agreement with the national inspecting authority of the country in which the procurement is made.
5. Conditions of Use of NATO Markings. The use, within any NATO nation, of the NATO marking system for identification of petroleum products, is to be conditional, not only upon observance of STANAG 1135 for the products themselves, but also upon the full application by that nation of the minimum quality surveillance measures in this STANAG.
6. If a product becomes off-specification with respect to the NATO allowable deterioration limits given in STANAG 1110 before use, a line of colour contrasting with the NATO Marking and the background colour of the container, is to be drawn diagonally across and beyond the rectangle enclosing the NATO code number. The thickness of the line will be such that it is clearly visible and the NATO marking easily read. The NATO marking is then to be considered cancelled and the product may if desired, be considered as an emergency substitute for the original product and thus may only be used under technical advice.
7. Packaging, Marking and Identification. Distribution of petroleum products shall be made only from batches which have passed the necessary inspection tests (see Annex A, paragraph 34 and Table A-1). All bulk and packaged products which are not in reusable containers (eg jerricans etc) shall be identifiable and records are to be available enabling the origin, location and history of products to be traced at any time. Details of the minimum marking requirements for packaged petroleum products are given in Annex A, paragraphs 31-33.

BULK TRANSPORTATION

SINGLE FUEL CONCEPT

8. The single fuel concept requires that F-34 fuel is available on the Battlefield. The supply and distribution of F-34 shall be to aviation fuel quality standards up to the point of consumption.

Aviation fuel quality procedures specified at Annex B, shall apply to field and out of area deployment, where applicable.

When additional performance additives, for example S-1750, are added for use by ground systems, the fuel shall no longer be F-34 and is therefore prohibited for aircraft use. This fuel shall be designated F-63 and Annex D quality standards shall apply.

PIPELINES

9. This section covers transportation by pipelines of the type used to transfer products from refineries, or ocean terminals to intermediate storage terminals and then up to the point of on-base storage or uplift. Fuels shall be tested as laid down in Annex A, paragraph 34. The use of pipelines for multi-product transportation requires that the terminals possess and employ the following:

- a. Spectacle flanges, double valves or double seating valves on the connections between pipes filled with different fuels. Quick closing valves are essential to accomplish batch cuts properly.
- b. Tanks for each type of interface, if the terminal is required to accept interfaces.
- c. Drain tanks for each type of drainage, if applicable.
- d. Instruments for quick and accurate interface detection.
- e. Interface re-injection pumps if the terminal is required to accept interfaces.
- f. Drainage re-injection pumps, if applicable.

10. Pipeline Marking. Single product piping, pumps and valves, should be marked in such a way as to indicate clearly the identity of the product. The NATO Marking for the product shall be incorporated as a minimum in any national marking or identification scheme and shall be displayed on all operating points.

11. Pipeline Condition Checks. The pipelines shall be kept clean by recurrent scraper cleaning or other suitable means. The internal condition of the pipelines should be monitored and checked by testing product samples, by examining spool pieces, or by evaluation of mathematical data such as the C factor.

12. Multi-Product Operations. During multi-product operations the following steps shall be taken:

- a. Pumping is to be continued, if possible, up to the moment when only one kind of fuel is left in the line between block valves or depots.
- b. The highest practical pumping rate throughout shall be adopted. The product must be moved at turbulent flow rate.
- c. Pumping interruptions and variations in the throughput rate, shall be limited as much as possible.
- d. The pipeline shall be kept full of product and be maintained under pressure.
- e. The progress of the interface in the pipeline shall be followed carefully so that the receiving depot or installation can be informed in sufficient time of the arrival of the interface.

- f. The arrival of the interface shall be carefully monitored. Only pure product cuts shall be made, except when otherwise authorised as in paragraph 12g.
- g. The interface shall be received into an interface tank unless previously approved procedures permit disposal through direct injection into a lower grade product with the assurance that the resultant mixture will be within the applicable product specification or authorised control limits.
- h. Re-injection of the interface into product shall be carried out only when a pumping operation is in progress and under laboratory control.
- i. Re-injection of interfacial mixtures shall not be made into fuel being delivered directly to users.

WATERBORNE TRANSPORT

13. This section covers bulk transportation by tankers. The term "tankers" when used in this section shall include ocean going and coastal tankers, barges, fleet replenishment vessels and refuelling craft. Tankers shall be used for one product only except when the products carried can be separated by completely segregated tanks and systems. Where this is not possible, tankers, except fleet replenishment vessels shall be confined to either "white" or "black" products. Examples of "white" and of "black" products are shown in Annex C Table C-1. All products of non-petroleum origin are classed as "black".

14. Change of Product Carried. If change of product is necessary, the tanker shall be thoroughly cleaned to the standards set out in Annex C, Table C-1. For barges and small motor vessels the cleaning procedures and precautions are set out in Annex C table C-II. It is recognised, in some instances, that machine washing may not be practicable or possible in every situation. In such cases national authorities may permit cleaning by other methods which will render the equipment acceptable for the intended cargo. For vessels that have previously carried "black" products the procedures set out in Annex C Table C-III shall be followed before the tanker is put into "white" service duty.

15. Carriage of More Than One Product. When carrying different types of product in one tanker, and the products are not separated by a cofferdam or pump room, each compartment is to be checked for contamination prior to off-loading (Annex A, paragraph 34 and Table A-1). At least two valves should separate piping systems containing different products but a positive means of segregation is preferred.

16. Fleet Replenishment Vessel Delivery. Fuels and lubricants delivered by fleet replenishment vessels shall be filtered in accordance with the standard for the particular product involved, as set forth in Annexes B, C and D unless these filtration requirements are waived by the receiving ship. Aircraft fuel and lubricant deliveries shall in all cases be in accordance with the provisions of Annex B. Replenishment vessels shall take all possible steps to remove water from their cargoes.

RAIL AND ROAD TRANSPORT

17. This section covers bulk transportation by railcar and road tank vehicle, up to the point of final storage before issue to user. The term "vehicle" when used in this section includes railcar and road tank vehicles. Wherever possible the vehicle shall be clearly marked with the NATO marking of the product carried. Railcars and road truck tanks shall be made of corrosion resistant materials or mild steel internally coated with a material satisfactory to the national authority. Vehicles are to be kept continuously to one product wherever possible. Where this is not possible appropriate cleaning procedures are essential before filling the vehicle (Annex A, Table A-VI). In addition the following should be maintained:

- a. Blanking caps are to be fitted to all filling and discharge connections when not in use.

- b. Domes of railcars and road tank vehicles are to be secured and sealed immediately after filling.
- c. Before discharge into storage, the quality of the consignment is to be checked (see Annex A, paragraph 34 and Table A-1).

BULK STORAGE

18. Before any internal painting or protective treatment is used in any tankage, the national authorities concerned must be satisfied of its suitability for use with the product stored in the presence of sea water or fresh water. The contents of storage tanks shall always be identified before delivery is made by any method of bulk transportation.

19. Different products are to be segregated from one another and all issues made through a segregated system. Segregation of approved products is to be by positive means, eg a blank flange, spectacle plate, spool piece or double valve with an open drain. Segregation by a single valve only is not sufficient.

20. Means are to be provided for removal of water used in line clearing or that which may be present in excess of that required for water bottoms where sanctioned by the national authority. Unless authorised at a particular installation by the appropriate authority the use of water bottoms is prohibited with aviation fuels. However, excess water must be drawn off before all transfers. Tanks containing static stocks should be checked for water at least monthly and any water found should be removed. Water which cannot be removed by routine draining should be sampled and examined visually for evidence of microbiological activity. The presence of slime at the water interface or cloudiness should be investigated to establish whether microbiological organisms are present. If microbiological activity is confirmed, action shall be taken in accordance with STANAG 7063 to eradicate the problem.

21. The maximum practicable settling time should be allowed in bulk storage tanks after fresh stocks have been put in, in order to permit settlement of water and solid matter. A minimum settling period of two hours should be observed for gasoline (aviation and automotive) and all aviation turbine fuels.. The settling period does not apply to bulk storage aboard ships; in that case 24 hours minimum is advisable. The settling period also does not apply to installations designed to:

- a. Prevent the introduction of contaminants into the system.
- b. Prevent the formation of contaminants within the system.

In this type of design, fuel enters the system through filter separators, internal surfaces of pipelines and tanks are of non-corrodible materials and the system is equipped with continuous quality monitors.

22. Identification and testing are to be carried out on all transfers. Testing may be waived but identification will be maintained where approved stocks have been transferred from fully segregated installation or depots by fully segregated pipeline, rail or road tanker and provided that no change in product is involved. The minimum sampling and testing requirements are shown in Annex A, Table A-1.

23. Whenever possible, bulk storage tanks are to be used for one product only. Where it is necessary to change the use of a tank from one product to another the appropriate change procedure is to be carried out. (See Annex A, Table A-VI for "white" products and Annex C, Table C - III for "black" products).

24. Tankage shall be cleaned when there is evidence from product samples, internal inspections or sludge tests, that a tank is excessively dirty with rust or sludge. The cleaning of tanks as part of a planned inspection scheme, to ascertain the mechanical integrity of the tank, is specified by STANAG 3609.

25. All dormant stocks are to be sampled and tested as laid down in Annex A paragraph 33 and Annexes B, C & D. Dormant stocks are stocks of products held in bulk, of which there have been no receipts during the minimum re-test frequency concerned, irrespective of whether there have been any issues during the same period.

26. Single product lines, pumps and valves are to be marked in such a way as to indicate clearly the identity of the product carried. For multi-product pipelines, connections at point of entry and valves at discharge points shall be suitably identified by a flag or sign indicating the product in the line. The NATO marking for the product is to be included in any national marking or identification scheme.

PACKED STOCKS

27. Container construction material must be compatible with the product. Internal protective coating must be resistant to product and water and not have a detrimental effect on the product. Internally galvanised containers and zinc rich coatings are prohibited for aviation and naval fuels, lubricant and hydraulic fluids. Long term storage for any petroleum products in galvanised containers is also prohibited. The closure is to be liquid and gas tight and resistant to "breathing". Where practicable, the container closures are to be capable of being sealed by an overseal or wire and lead seal.

28. Filling Containers. Before filling, all containers shall be clean and free from loose rust, paint flakes, etc. When the product has been micronically filtered, meticulous cleanliness of the container and filling equipment must be assured. Containers are to be closed immediately after filling and appropriately marked.

29. Storage. For identification purposes different products are to be stored separately from each other. Stocks with similar filling dates are to be stored together wherever possible. Normally stocks are to be consumed on the basis of oldest stock first. Except in emergency, containers are not to be stored in direct contact with the ground. They shall be stored on raised hard standings and whenever practicable under cover. In conditions where storage in the open is unavoidable, all filled drums (200 litres and above) are to be stored on their sides (belly stacked) with both closures below liquid level and in a position such that the depth of liquid above the closures is as large as possible. Whenever practicable this method of storage is preferable even under cover.

30. Inspection. External inspection of containers is to be made periodically and markings renewed as necessary. Visual examination of the product shall also be carried out for evidence of degradation, or separation of the additive and evidence of oil separation in greases. Products suspected of being contaminated are to be tested in accordance with Annex A, paragraph 34. Incorrectly marked, suspect or off-specification stocks are to be quarantined pending disposal instructions. All dormant stocks are to be sampled and tested as laid down in Annex A, paragraph 34 and Annexes B, C and D. In particular the periodic testing requirements of Annexes B, C and D shall be applied to dormant stocks of air, marine and ground products respectively, regardless of the service holding the stocks.

MINIMUM CONTAINER MARKINGS FOR PACKED PETROLEUM PRODUCTS

31. It is essential that containers for petroleum products are marked so that;

- a. The product they hold may be readily identified in national and NATO supply systems.
- b. The origin and age of the product may be established at any time.
- c. The hazards associated with the product eg flammable, toxic or corrosive, are clearly indicated.

NATO/EAPC UNCLASSIFIED

ANNEX A to
STANAG 3149
(Edition 8)

32. The following common markings are the minimum to be applied to all petroleum products packed in main base areas or manufacturers' works and, where possible, to products packed in the field:

- a. NATO Marking (NATO code number in accordance with STANAG 1135 enclosed by a rectangle).
- b. Nomenclature (product description).
- c. * Batch number.
- d. * Filling date (month and year).
- e. * Contract No, or Contractor's name (or initials).
- f. Particulars of weight or volume of contents.
- g. Safety and use markings, where applicable.
- h. Re-inspect date.

NOTE: * These markings may be in the form of a national code, if so desired.

33. The minimum common marking for products packed in reusable containers (eg jerricans), in the field is the NATO marking, but the markings listed in Annex A, paragraph 32 will be applied when practicable. Additionally, the marking is to be in a position such that the NATO code number is readily seen when the containers are stacked. Where products are packed in outer containers such as boxes or cartons these minimum markings are also to be included in the markings placed on the outer container. When packed products (including the containers) have been re-inspected as dormant stock, in accordance with Annex A, paragraph 34 and found fit for further use, the old re-test date should be deleted and the new re-inspection date is to be marked on all containers. The marking is to be in the following form:

RE-INSPECT (Month and year to be inserted).

Packed petroleum products do not have an indefinite shelf life. The procedure to be adopted when re-living petroleum products shall be as follows:

The first re-test date shall be at the original frequency stated in Annexes B, C and D, subsequent re-tests shall follow at half that frequency. After 72 months from date of fill, the product should no longer be authorised for NATO cross servicing.

For small containers which are packed inside boxes or cartons the markings may be placed on the outer container only. The locations and colour of the markings, the method of marking and the marking materials shall be as specified by the national authority, and in accordance with STANAG 1135. However, all markings are to be clearly and legibly inscribed, of a size appropriate for the type of container and the materials used are to be selected for durability. On coloured containers, the colour of the markings is to be in contrast with the colour of the container.

MINIMUM SAMPLING AND TESTING REQUIREMENTS
(INCLUDING FUELS HANDLED IN THE NATO PIPELINE SYSTEMS)

34. The type of test to be used will, as a minimum, be that required by Annex A, table A-1. The types of tests and their significance are as follows:

- a. Type A Test. Complete specification tests to be performed before acceptance of the product from the supplier (for Naval products see Annex C). This test is also required on any tank (excluding those at operational units, eg airfields, etc) following initial filling, filling on change of product or filling after cleaning.
- b. Type B-1 Test. This test is to be performed at the conclusion of product transfers when made through non-segregated systems, such as, but not limited to, multi-product tankers or pipeline systems and common dock systems.
- c. Type B-2 Test. This test is to be performed to determine product quality after the prescribed periods of storage.
- d. Type B-3 Test. This test is to be performed when re-establishing a batch following product transfer through a non-segregated system, consolidation of batches and on tanks containing interface mixtures from pipelines prior to re-injection.
- e. Type C Test. Visual identification tests to be performed on products to ensure that no change has taken place. This type of test is primarily applicable to segregated systems but is also required for checking tanker loadings/discharges, pipeline movements and rail car/tank truck operations (for Naval products see Annex C).

Notes:

- 1. The application of these tests is given in Annex A, Table A-1, of this STANAG.
- 2. Details of the individual tests applicable in each of the above-mentioned types of test are given as under:

Turbine Engine Fuel Aviation	Annex A, Tables A-II
Gasoline, Automotive	Annex A, Table A-III
Diesel Fuels and Kerosene	Annex A, Table A-IV
Fuel Oils	Annex A, Table A-V
Type B-2 Tests on Aircraft Lubricants and Special Products	Annex B, Tables B-III to B-VIII
Type B-2 Tests on Naval Fuels and Lubricants Products	Annex C, Table C-V
Type B-2 Tests on Army Lubricants and Special Products	Annex D, Tables D-III

3. In all cases the methods of sampling used are to be those of the IP or ASTM or their equivalent.

NATO/EAPC UNCLASSIFIED

ANNEX A to
STANAG 3149
(Edition 8)

MINIMUM SAMPLING AND TESTING FOR PETROLEUM PRODUCTS (INCLUDING FUELS HANDLED IN THE NATO PIPELINE SYSTEM)

Serial	Location of Stock	Type of Storage	When Sampled	Type of Sample	Type of Test Required	Remarks
1	At refineries, blending installation etc. on procurement and at main installations, including national depots and ocean-importing points, on establishment of new batches.	Bulk	Before acceptance of new material and after establishment of new batches.	Upper, middle and lower levels samples (1.)	A	
2	Store tanks and pipeline main depot receiving tanks	As above	Before discharge	As Serial 1	B-2	Stocks in these tanks which have been tested previously, and which are still within the requisite "test" period (See Annexes B, C and D) need not be tested, but referee sample is to be taken
3	Tanker vessels	As above	After Loading	All levels from each compartment.	C	Providing Type C tests indicate satisfactory comparison with original shore tank test results, vessel may be allowed to sail. Where circumstances permit, Type B-1 tests will be accomplished soonest so that any evidence of non-compliance with quality criteria may be reported to consignee before vessel arrives at destination.
4	Tanker vessels	As above	Before discharge	As Serial 3	B-1 C	Providing a Type A analysis report accompanies the cargo, discharge may commence once Type C test results indicate satisfactory comparison. Composite samples should be taken and retained for testing should shore tanks fail test. Before discharge commences, each cargo compartment is to be sounded for water using water finding paste.
TRANSFERS FROM MAIN INSTALLATION (SEE SERIAL J) TO OTHER INSTALLATION						
5	Non Segregated Systems a After receipt of fuel by pipeline systems which has previously carried a different product to that being received Non Segregated Systems b After receipt of fuel by pipeline systems which has previously carried the same product to that being received other than to those tanks capable of delivering to airfields.	Installations and depots bulk tanks Installations and depots bulk tanks	After receipt of fuel After receipt of fuel	As Serial 1 As Serial 1	B-1 No Test Required following inter-tank transfers. However, B-1 to be carried out on tanks capable of delivering to airfields.	For deliveries of fuel from all commercial pipeline systems into any part of the NPS, serial 1 (A Test) shall apply For deliveries of fuel from all commercial pipeline systems into any part of the NPS, serial 1 (A Test) shall apply

Table A-1 (Concluded on Page A-12)

NATO/EAPC UNCLASSIFIED

ANNEX A to
STANAG 3149
(Edition 8)

Serial	Location of Stock	Type of Storage	When Sampled	Type of Sample	Type of Test Required	Remarks
	c. After receipt of fuel by waterborne transport and received through a fully segregated system or through a non-segregated system which is thoroughly cleared between products. The latter arrangement to be approved by inspecting authority. d. After receipt of fuel by railcar, road wagon or single product pipeline system and received through a fully segregated system.	Installations and depots bulk tanks	After receipt of fuel	As Serial 1	B-3	
		Installation and depots	After receipt of fuel	As Serial 1	No test required (see remarks)	A copper strip corrosion test every 6 months is recommended. Samples are to be retained for 1 month (or as otherwise agreed) for reference purposes.
TRANSFERS WITHIN A DEPOT						
6	Segregated Systems a. Consolidation of approved batches through a fully segregated system or a system that has previously carried the same product it that being transferred. b. Transfer of approved batches through a fully segregated system to a fully segregate service tank for road or rail loading services	Installations and depots	After receipt of fuel	As Serial 1	No test required	Samples will be retained for 2 months for reference purposes or consolidated batches be tested (B1).
		Installations and depots	After receipt of fuel	As Serial 1	B-1 to be carried out on tanks capable of delivering to airfields.	Witness samples will be taken and retained for one month.
	Non-Segregated Systems c. Consolidation of approved batches through a non-segregated system or a system that has previously carried a different product from that being transferred.	Installations and depots	After receipt of fuel	As Serial 1	B-1 if agreed by inspection authority otherwise B-3.	
7	Dormant stocks wherever located	Installations and depots	Periodically as required by the appropriate Annex.	As Serial 1 (See remark b)	A or B-2 as appropriate (See remarks)	a. Separate samples, upper, middle and lower shall be taken and tested to establish homogeneity. If homogeneous these samples shall be mixed for Type A or B-2 tests as appropriate. b. At the discretion of the inspecting authority, having regard to the type of product, age of stock, conditions of storage, etc.

Table A-1 (Concluded on Page A-12)

A-11

NATO/EAPC UNCLASSIFIED

NATO/EAPC UNCLASSIFIED

ANNEX A to
STANAG 3149
(Edition 8)

8	Filling point for road and railcars and containers	Installation and Depots	Before filling commences and on change-over to fresh feed tank.	Line sample	Visual check	
9	In railcars and road tank vehicles.	Installation and Depots	After loading and before discharge.	Delivery line sample or all level samples from the railcar or vehicle.	Visual check	In the case of compartmented vehicles, a sample from, each compartment is to be checked.
10	Transfers by pipeline	Installation and Depots	Locating and passage of interface.	Line sample	C	
11	Tanks containing interface mixtures from pipeline for re-injection.	Installation and Depots	Before re-injection.	As Serial 1	B-3 (See remark)	Re-injection of interface products is to be under the technical control of the pipeline authority.
12	Packed Stocks wherever located.	Packed stocks	(1) Periodically as required by the appropriate Annex (see remark a). (2) When contamination or deterioration of product or container is suspected. (3) When identity is uncertain	Representative sample for liquids. Individual samples for all other products.	A or B-2 as appropriate (See remarks)	a. Where an agreed inspection period has not been stipulated the product is to be inspected at least annually. b. At the discretion of the inspecting authority, having regard to type of product, age of stock, conditions of storage etc.

Note 1 : All-level samples are obtained by submerging a closed sampling container to the lowest level of the liquid being sampled, then opening it and raising the container at a steady rate such that it will be nearly but not quite full when withdrawn.

Note 2 : In all cases, the methods of sampling are to be those of the IP or ASTM or their equivalent.

TABLE A-I (Concluded)

NATO/EAPC UNCLASSIFIED

ANNEX A to
STANAG 3149
(Edition 8)

TESTS REQUIRED ON TURBINE ENGINE FUEL AVIATION
(F-34, F-35, F-37, F-40, F-44)⁽⁵⁾

Characteristics	TYPES OF TEST			
	B-1	B-2	B-3	C
TEST REQUIREMENTS⁽¹⁾				
Water and Solids (Visual Check) ⁽²⁾	X	X	X	X
Colour (Visual)	X	X	X	X
Density or API Gravity	X	X	X	X
Distillation	X	X	X	-
Copper Strip Corrosion	X	X	X	-
Freezing Point	X	X	X	-
Existent Gum	X	X	X	-
Vapour Pressure	X (F-40 only)	X (F-40 only)	X (F-40 only)	-
Flash Point	X (not F-40)	X (not F-40)	X (not F-40)	-
Water Reaction	X	X	X	-
Lead Content (If contamination with leaded fuels is suspected).	X	X	X	-
Fuel System Icing Inhibitor FSII ⁽³⁾	X (Not F-35)	X (Not F-35)	X (Not F-35)	-
Electrical Conductivity ⁽⁴⁾	X (Not F-44)	X (Not F-44)	X (Not F-44)	-
Thermal Stability	-	X	X	
Note 1: For application of the above tests, see Annex A, para 34, and Table A-1.				
Note 2: Obtain sample in a clear round one litre glass bottle. Swirl the bottle vigorously so that a vortex is formed. Visually check for sediment at the point of the vortex. If sediment is visible, a spot larger than 3 mm diameter indicates corrective action should be taken to prevent the delivery of contaminated fuel.				
Note 3: FSII content of F34, F40 and F44 should be checked on delivery into a bulk fuel tank, after one month and thereafter every six months if the stock remains static (i.e. no deliveries have been made into the tank during that period).				
Note 4: If fuel contains conductivity additive, conductive readings should be taken within 2 minutes of sampling.				
Note 5: F-37 is not a distributed fuel but blended at the point of issue.				

TABLE A II

NATO/EAPC UNCLASSIFIED

ANNEX A to
STANAG 3149
(Edition 8)

TESTS REQUIRED ON GASOLINE AUTOMOTIVE (F-57, F-67)

Characteristics	TYPES OF TEST			
	B-1	B-2	B-3	C
TEST REQUIREMENTS⁽¹⁾				
Appearance	X	X	X	X
Water and Solids (Visual Check)	X	X	X	X
Colour	X	X	X	X
Density or API Gravity	X	X	X	X
Distillation	X	X	X	-
Vapour Pressure	X	X	-	-
Copper Strip Corrosion	-	X	X	-
Existent Gum	-	X	X	-
Knock Rating ⁽²⁾	X	X	-	-
Oxidation Stability	-	X	-	-
Note 1 : For applications of the above tests, see Annex A, para 34 and Table A-1.				
Note 2 : To be done if local facilities permit, otherwise determine lead content, except in the case of F-67.				

TABLE A-III

TESTS REQUIRED ON DIESEL FUELS (F-54, F-63, F-65, F-75, F-76) AND KEROSENE (F-58)⁽⁴⁾

Characteristics	TYPES OF TEST			
	B-1	B-2 ⁽³⁾	B-3	C
TEST REQUIREMENTS⁽¹⁾				
Appearance	X	X	X	X
Colour	X	X	X	X
Density or API Gravity	X	X	X	X
Distillation ⁽²⁾	X	X	-	-
Flash Point	X	X	X	X
Carbon Residue (diesel fuel only) ⁽³⁾	X	X	-	-
Note 1: For application of the above tests, see Annex A, para 34, and Table A-1.				
Note 2: Only required if change in colour and/or Density occurs after procurement.				
Note 3: These tests do not apply to F-75 and F-76. See Annex C Table C-V for F-75 and F-76.				
Note 4: F-63 is not a distributed fuel but blended at point of issue				

TABLE A-IV

TYPES OF TESTS REQUIRED ON FUEL OIL (F-77)

Characteristics	TYPES OF TESTS			
	B-1	B-2	B-3	C
TEST REQUIREMENTS⁽¹⁾				
Flash Point	X	X	X	X
Density	X	X	X	X
Water	X	X	X	X
Viscosity	X	X	-	-
Pumpability (or Pour Point)	-	X	-	-

Note 1: For application of the above tests, see Annex A, para 34, and Table A-1

TABLE A-V

NATO/EAPC UNCLASSIFIED

ANNEX A to
STANAG 3149
(Edition 8)

QUALITY SURVEILLANCE PROCEDURE FOR CHANGE OF GRADE OF WHITE (CLEAN) PRODUCTS IN STORAGE TANKS, RAILCARS, ROAD TANK VEHICLES AND REFUELLERS

Change To From	Leaded Gasoline	Non Leaded Gasoline	Turbine Fuel Aviation (Kerosene Type)	Turbine Fuel Aviation (High Flash Point Kerosene Type)	Turbine Fuel Aviation (Wide Cut Type)	Kerosene	Diesel
Leaded Gasoline	A	C	C	C	C	C	C
Non Leaded Gasoline	A	A	B	B	A	B	B
Turbine Fuel Aviation (Kerosene Type)	B	B	A	B	A	A	B
Turbine Fuel Aviation (High Flash Point Kerosene Type)	B	B	A	A	A	A	A
Turbine Fuel Aviation (Wide Cut Type)	B	B	B	B	A	B	B
Kerosene	B	B	A	B	A	A	B
Diesel	B	B	B	B	B	A	A

In all cases tanks, lines etc are to be drained to fullest extent practicable and the following action taken:
Change of Grade Procedure
(A) None; fill with desired product.
(B) Flush with desired product, drain, fill with desired product (Notes 1 and 2).
(C) Inspect for and remove all sludge, in particular traces of lead and gum, flush sufficiently with desired product, drain, fill with desired product.

Note 1: When draining railcars and tank vehicles particular attention should be given to sumps, pumps, filters, hoses and other components likely to trap quantities of liquid.

Note 2: In large bulk storage tanks flushing with product is not required. Draining will be accomplished by main suction line, followed by further product removal through the water drain off.

Note 3: When changing from black to white product, see Annex C, Table C-III.

TABLE A-VI

A-17
NATO/EAPC UNCLASSIFIED

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

AVIATION PETROLEUM PRODUCTS

CONTENTS

	<u>PARAGRAPH No</u>
<u>GENERAL</u>	1-2
<u>BULK STORAGE ON AIR BASES</u>	
Removal of Settled Water	3
Filtration	4
Internal Preservation	5
Use of Zinc and Copper Compounds in Contact with Fuel	6
Internal Coating of Tanks	7
Periodical Inspection	8
High Flash Point Aviation Turbine Fuel	9
<u>DISPENSING FUELS AND OILS AT AIR BASES</u> <u>(INCLUDING HYDRANT AND AIRCRAFT CARRIER EQUIPMENT)</u>	
Identification and Product Marking of Vehicles and Equipment	10
Internal Inspection of Tanks	11
Filters	12
Fuel Delivery Nozzles	13
Change of Product Procedure	14
Water and Sediment Checks	15-16
Separation of Solid Matter and Water	17
Refuelling Hoses	18
<u>FUELLING/DEFUELLING PROCEDURES AT AIR BASES</u>	
Filling of fuelling Vehicles and Equipment	19
Refuelling Aircraft from Packed Stocks	20
Defuelling of Aircraft	21-25
<u>OIL REPLENISHMENT PROCEDURE</u>	
Filling of Oil Replenishment Vehicles and Equipment	26
Re-oiling Aircraft from Packed Stocks	27
Replenishment with Grease	28
Replenishment with Hydraulic Fluids	29-31
<u>AIRCRAFT SPECIALITY PRODUCTS</u>	32
<u>TESTING OF AVIATION PRODUCTS AT INLAND TERMINALS</u> <u>AND INTERMEDIATE INSTALLATIONS</u>	33-36

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

PAGE

Table B-I	-	Minimum Standards of Filtration.	B-8 and B-9
Table B-II	-	Minimum Frequency for Testing Aviation Petroleum Products	B-10
Table B-III	-	B-2 Tests - Lubricating Oil, Aircraft	B-11-B-13
Table B-IV	-	B-2 Tests - Grease, Aircraft	B-14-B-16
Table B-V	-	B-2 Tests - Hydraulic Fluids, Aircraft	B-17
Table B-VI	-	B-2 Tests - Aviation Speciality Products	B-18-B-22
Table B-VII	-	B-2 Tests - Aircraft Corrosion Preventative Oils/Compounds	B-23-B-24
Table B-VIII	-	B-2 Tests - Propellants	B-25

AVIATION PETROLEUM PRODUCTS

GENERAL

1. The common requirements contained in Annex A of this STANAG are to be applied to all aviation petroleum products, in addition to the detailed requirements laid down in this Annex.
2. The term "air bases" used in this STANAG includes aircraft carriers and any other ships designed or adapted to carry and refuel aircraft.

BULK STORAGE ON AIR BASES

3. Removal of Settled Water. Weekly water checks are to be carried out, and any water is to be removed immediately, except where a water bottom is authorized.
4. Filtration. Filters of a suitable type are to be fitted as near as possible to the ends of all outgoing lines. See Annex B, Table B-1. They are to be inspected at least once per week, cleaned as necessary, and any defects remedied at once. Where filter separators are fitted they are to comply with STANAG 3967, or equivalent national specification. Filter and filter separators shall be fitted with pressure differential gauges conforming to STANAG 3583. Records of the daily reading of pressure differential gauges will indicate when filter cartridges are to be replaced according to criteria laid down in national orders.
5. Internal Preservation. In any fuel installation likely to be out of service for 4 months or more, pumps, fans, motors etc are to be given protection, either in place or by transfer to store. Tanks are to be isolated, cleaned, dried and sealed. Water-displacing fluids are not to be used for the internal protection of aviation fuel tanks, as they are difficult to remove completely and affect the water reaction of the fuel.
6. Use of Zinc and Copper Compounds in Contact with Fuel. The internal protection of pipelines, storage tanks and other equipment used for aviation fuels, with protective treatments containing zinc is prohibited. Zinc chromate can be used as a primer provided that it is overcoated with an approved epoxy finish coat. The use of copper and copper alloys shall be avoided, select materials such as stainless steel or aluminium instead.
7. Internal Coating of Tanks. All new and replacement tankage normally used for direct filling of refuelling vehicles or which directly serve hydrant refuelling points, other than those constructed of non-corrodable material shall be internally coated with a nationally approved material. In addition, all tanks of this type which are in use and likely to remain in use should be internally coated as opportunity permits.
8. Periodical Inspection. Tanks are to be internally inspected as prescribed in STANAG 3609 and cleaned as necessary.
9. High Flash Point Aviation Turbine Fuel. Before delivery of high flash point aviation turbine fuel to storage on aviation capable ships, the flash point of the product is to be verified. When aviation fuel containing Fuel System Icing Inhibitor (FSII) is stored on board aviation capable ships, a test is to be carried out to ensure that the minimum level of FSII (defined in STANAG 1110) is present on delivery to aircraft. The test is to be carried out as follows:
 - a. Weekly - each bulk storage tank.
 - b. When contamination with water is suspected

DISPENSING FUELS AND OILS AT AIR BASES (INCLUDING HYDRANT AND AIRCRAFT CARRIER EQUIPMENT)

10. **Identification and Product Marking of Vehicles and Equipment.** All refuelling and oil replenishment dispense points are to be prominently marked with the NATO marking appropriate to the product they contain.

11. **Internal Inspection of Tanks.** Tanks of refuelling and oil replenishment vehicles are to be inspected internally at intervals not exceeding 24 months. They are to be cleaned internally as necessary, and in the case of internally protected tanks, any defects in the protective lining are to be remedied.

12. **Filters.** The filters fitted to refuelling and oil replenishment equipment are to be of the agreed minimum standard laid down in Annex B, Table B-I. When refuellers and hydrant dispensers are fitted with filter separators, they are to comply STANAG 3967 or equivalent national specification. Filters and filter separators shall be fitted with pressure differential gauges conforming to STANAG 3583. The filters are to be inspected, cleaned and serviced periodically as necessary. Records of the daily readings of pressure differential gauges will indicate when filter cartridges are to be replaced according to criteria laid down in national orders.

13. **Fuel Delivery Nozzles.** The strainers in refuelling nozzles and pressure refuelling to be 60 mesh (240 microns). They are to be inspected at least once every month and cleaned or repaired as necessary. The nozzle dust caps are to be inspected daily for security. They are to be removed only during refuelling operations and replaced immediately afterwards.

14. **Change of Product Procedure.** The appropriate change of product procedure is to be carried out whenever the product to be dispensed is changed. See Annex A, Table A-VI.

15. **Water and Sediment Checks.** All refuelling and oil replenishment vehicles and equipment are to be tested for water and sediment on the following occasions:

- a. At the start of each day before refuelling operations commence.
- b. On aircraft carriers and other ships operating or refuelling aeroplanes and helicopters at the start of each day and before refuelling operations commence.
- c. On each occasion when a tank is refilled. Before fuelling operations commence the product is to be allowed to stand as long as possible before testing.

16. When practicable the test is to be accomplished by draining a sample from the appropriate points into a suitable container and inspecting visually for water and solids. If large quantities of water or solids are found, they are to be removed immediately and the reason for their presence is to be investigated before refuelling.

17. **Separation of Solid Matter and Water.** An efficient means of removing suspended matter and undissolved water is to be provided. The fuel must be clear and bright and contain no visible free water or solid matter at the ambient temperature. When fuelling aircraft, the water and solids removal equipment is to be as close to the aircraft as possible. In addition, the following apply:

- a. **Aviation Turbine Fuels.** In the case of aviation turbine fuels, suspended matter and undissolved water shall be removed by means of filter separators complying with STANAG 3967, or the equivalent national specification. The solid matter and water content of the fuel delivered from the filter separators shall be checked at least every 3 months. The quantitative method that shall be used for solids is ASTM D2276/IP216 and a preferred quantitative method for free water content is ASTM D3240, although other semi-quantitative free water detection methods may be used. If the solids content exceeds 1 mg/l and/or free water exceeds 30 ppm, no further refuelling of aircraft shall be made using this equipment. The cause shall be investigated and remedial action taken.

b. Thrust Augmentation Fluid. In the case of thrust augmentation fluids (water and water methanol mixtures), the total solids (residue on evaporation) of the water used to formulate the mixtures shall not exceed 10 ppm and the pH shall be in the range 5.0 to 7.5.

18. Refuelling Hoses. The following hose flushing procedures are to be carried out :

a. New Hoses. Before using new or re-issued hose for refuelling, the hose should be flushed with at least 1,800 litres of the fuel to be used. After flushing take a one litre sample and examine fuel visually for excessive discoloration or solids. If the sample indicates contamination, internally soak the hose for three hours, flush with at least 1,800 litres of the fuel to be used, after flushing take a sample and examine for contamination. Failure will require additional internal fuel soak until the sample is free of contamination.

b. Aircraft Refuelling Hoses. Hoses on aircraft refuelling equipment which have not been used for 7 days or more shall be flushed for not less than one minute prior to refuelling an aircraft.

FUELLING/DEFUELLING PROCEDURES AT AIR BASES

19. Filling of Fuelling Vehicles and Equipment. When filling check to ensure that the correct product is being used. Allow as long a settling period as practicable after filling and then test for water and solids as per paragraph 15 above. All equipment shall meet the filtration requirements of Table B-1.

20. Refuelling Aircraft from Packed Stocks. Direct refuelling from packed stocks is to be avoided whenever possible, but in cases where it is necessary, all fuel used is to be filtered between container and aircraft tank to the standard defined in Annex B, Table B-1. The container markings are to be checked to ensure the correct product is being used.

21. Defuelling of Aircraft. Aviation fuel stored in the tanks of aircraft is subject to rapid weathering and possible microbiological activity. Aviation fuel stored in aircraft tanks for a period of six months or more is not to be used until a satisfactory B-2 test report is available. If the test report is unsatisfactory or if micro-organism contamination has been detected, the aircraft is to be defuelled and treated in accordance with STANAG 7063 if applicable and refuelled with fresh fuel.

22. In tropical or sub-tropical areas, aviation fuel stored in aircraft tanks for three months or more is to be considered suspect and dealt with as in paragraph 21 above.

23. When fuel from aircraft tanks is returned to a refueller or to ship's tank the defuelling arrangements are to be such that dispense filters are not used in reverse.

24. Aircraft should only be defuelled into storage/fuelling systems if the quality of the fuel can be assured. If there are any doubts about the quality of the fuel the aircraft should be defuelled into a segregated container and the fuel checked before returning it to storage/fuelling system. All defuelled fuel should pass at least one filter/separator before being returned to a fixed hydrant system or to another aircraft.

25. Defuelling of aircraft operating on F-37 must be undertaken in such a manner that inadvertent fuelling of uncleared aircraft and the disarming of FWS is averted. Where an aircraft on F-37 requires to be defuelled, procedures must ensure that co-mingling of F-37 into stocks of F-34/5 is prevented. Where exceptionally F-37 defuelled from an aircraft is transferred into bulk storage, the approval of the Service Authority must be sought. In this circumstance, F-37 must be drowned at a ratio of 100:1 with either F-34 or F-35. Quality procedures identified in paras. 21-24 must be adhered to.

OIL REPLENISHMENT PROCEDURE

26. Filling of oil Replenishment Vehicles. When filling check to ensure that the correct product is being used. The replenishment equipment should be capable of meeting the requirements of Annex B Table B-1 for filtration.
27. Re-oiling Aircraft from Packed Stocks. Oil from packed stocks, e.g. drums and jerricans is to be filtered to the appropriate standard shown in Annex B, table B-1 before dispensing to aircraft tanks. Oil from small hermetically sealed containers need not be filtered before dispensing to aircraft tanks. Any oil remaining in opened containers etc. after aircraft servicing will not be retained for future use but will be added to servicing equipment or disposed of as used oil. The container marking is to be checked to ensure that the correct product is being used.
28. Replenishment with Grease. The container marking is to be checked, to ensure that the correct product is being used. The most important considerations are to ensure cleanliness of the grease, the surfaces to which it is being applied and the equipment used on its application. The grease is to be taken from the original container and is not to be repackaged. The grease is to be applied as far as possible with a grease gun or similar device, and not by hand application. The lids of all containers are to be replaced immediately after use.
29. Replenishment with Hydraulic Fluids. The most important consideration is to ensure cleanliness of the fluid and of the equipment used in its application. The container marking is to be checked, to ensure that the correct product is used. The different types of hydraulic fluid such as vegetable, petroleum and synthetic based, are to be kept segregated from each other.
30. Fluid from non-hermetically sealed containers is to be filtered to the appropriate standards shown in Annex B, Table B-1 before dispensing. Fluid from small hermetically sealed containers need not be filtered before dispensing to aircraft tanks. Any fluid remaining in open containers after servicing will not be retained but will be added to servicing equipment or disposed of as used oil.
31. The fluid is to be taken from the original container and is not to be repackaged. It is recommended that all hydraulic fluids should be supplied in containers not exceeding 5 litres, except when a larger container is needed for replenishment rigs.

AIRCRAFT SPECIALITY PRODUCTS

32. The quality surveillance requirements for grease and hydraulic fluids are, where practicable, to be applied to speciality products.

TESTING OF AVIATION PRODUCTS AT INLAND TERMINALS AND INTERMEDIATE INSTALLATIONS

33. When aviation products are transferred through a multi-products pipeline, Type B1 tests as defined in Annex A, para 34 of this STANAG, are required.
34. Multi-product pipelines are to be operated so that fuel entering pipeline, depot receiving tanks is free from interface products. Separate tanks ('slop' tanks) are to be used for the reception of interfaces. Following establishment of a pipeline depot batch, no issues are to be made therefrom until the quality of the batch has been assured (see Annex A para 34 and Table A-I).
Re-injection of interface products is only permissible under the technical control of the Pipeline Authority within the limits of STANAG 1110. Normally this will mean that the maximum amount of lead content in aviation turbine fuels delivered to the users must not exceed the deterioration limit of 0.0140g lead per litre.
35. Laboratory facilities capable of performing at least Type B-1 tests should be made available to serve pipeline terminals.

36. One or more central laboratories should be set up to be available for full testing of referee samples originating from terminals, intermediate installations and airfields.

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

MINIMUM STANDARDS OF FILTRATION⁽⁵⁾⁽⁶⁾

Serial No	Product	Issues From all Installations						Issues into Aircraft
		Deliveries to Airfield Receipt /Settling Tanks	To Railcars or Road Vehicles	To On-Base Operating Tanks	To Containers (Packed Stocks)	Into Refuelling Vehicles or Launches		
1	Turbine Fuel Aviation	150 microns	Filter Water Separator ⁽¹⁾	Filter Water Separator ⁽¹⁾	Filter Water Separator ⁽¹⁾	Filter Water Separator ⁽¹⁾	Filter Water Separator ⁽¹⁾⁽³⁾	
2	Lubricating Oil, Aircraft Turbine Engine	-	150 microns	-	150 microns	150 microns	From small hermetically sealed containers directly into aircraft - no filtration. Otherwise 10 microns.	
3	Hydraulic Fluids	-	-	-	Either 5 microns filtration ⁽²⁾ or specification control of particulate count and/or total weight of contaminants	-	Small hermetically sealed containers direct into aircraft no filtration. Otherwise see ⁽⁴⁾	
4	Thrust augmentation Fluids (water and methanol water mixtures)	-	-	-	80 microns	80 microns	80 microns. In addition, for turbine engines, the fluid must meet requirements of Annex B, para 17 b.	

Notes Applicable to Table see Page B-9

TABLE B-1 (Concluded on page B-9)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

<p>Note 1 : Suitable filtration equipment shall be installed in order that filtered aviation turbine fuel contain not more than 1 mg/l of solids and 30 ppm of water.</p> <p>Note 2 : This shall be a filter capable of cutting off a minimum of 96% by weight of all solid contaminant and/or particles of size 5 microns or larger.</p> <p>Note 3 : These minimum quality requirements shall also apply to any other grade of fuel issued to aircraft powered by gas turbine engines.</p> <p>Note 4: Aircraft hydraulic fluid dispensing and servicing equipment is to be capable of supplying fluid to the following cleanliness standard:</p>		
<u>MICRON SIZE RANGE</u>	<u>MAXIMUM PARTICULATE COUNT/100 ml SAMPLE (LATEX SPHERES)</u>	<u>MAXIMUM PARTICULATE COUNT/100 ml SAMPLE (ACFTD)</u>
5 - 15	30,000	42,00
above 15 - 25	1,000	2,300
above 25 - 50	250	875
above 50 - 100	25	150
above 100	10	75
<u>MICRON SIZE RANGE</u>	<u>MAXIMUM PARTICULATE COUNT/100 ml SAMPLE (ISO 11171)</u>	
5-14	38,900	
above 14-21	3,460	
above 21-38	1,220	
above 38-70	212	
above 70	64	
<p>For reference purposes the method to be used for particulate counting is that given in STANAG 3713</p> <p>Note 5: Comparison between filter mesh and micron sizes.</p>		
<u>OPENING (MICRONS)</u>		<u>MESH SIZE (MEASURES PER INCH)</u>
50		270
80		180
100		140
150		100
200		70
240		60
<p>Note 6: Filtration requirements are the responsibility of the receiving installation.</p>		

TABLE B-1 (Concluded)

NATO/EAPC UNCLASSIFIED
B-C

MINIMUM FREQUENCY FOR TESTING AVIATION PETROLEUM PRODUCTS

Dormant stocks of aviation petroleum products are to be sampled and submitted for Type A or Type B-2 testing (see Annex A, para 34) whenever stocks are suspected of being off-specification, or at the minimum frequency indicated below:

PRODUCT DESCRIPTION	MINIMUM FREQUENCY OF TESTING	
	BULK	PACKAGED
Turbine Fuel, Aviation	12 months	12 months
Turbine Fuel, Aviation in Collapsible Containers	6 months	6 months ⁽²⁾
Lubricating Oil, Greases, Hydraulic Fluids, Speciality Products, Corrosion Preventives and Propellants	See entries in Annex B, Table B-III to B-VIII See also 3 below	
Note 1 : Under arctic storage conditions, inspection of aviation fuels and lubricants may be made every two years (where a shorter period is specified above or in Annex B, Table B-III to B-VII).		
Note 2 : New, small, collapsible containers, e.g. "sealed drums", should not be used for long storage of aviation fuels unless previously soaked with product for at least 24 hours, then evacuated and refilled.		
Note 3 : Where a visual check is specified in Annex B, Table B-III to B-VII, it shall be carried out by suitably trained personnel and entails inspection of a sample of the product taken from the container. In the case of liquid products, a bottom sample shall first be taken for examination for water, sediment or separation of components, after which the container shall be thoroughly agitated and a second sample taken for general examination (a bottom sample is not required from containers of capacity 5 litres or less). Containers shall be inspected at the same time for damage, leakage, rust and corrosion. Hermetically sealed products are liable to deterioration when opened and these products shall, after inspection, be used immediately or disposed of as authorized.		

TABLE B-II

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - LUBRICATING OIL, AIRCRAFT

NATO Code Number	O-135	O-136	O-138	O-142	O-147
TEST REQUIREMENTS ⁽¹⁾					
Appearance	X	X	X	X	X
Pour Point	X	X	X	X	X
Viscosity at 100°C		X	X		
Viscosity at 54.4°C					X
Viscosity at 40° C	X			X	X
Viscosity at -54° C					X
Neutralization No (or Total and/or Mineral Acidity)	X	X	X	X	X
Ash %	X	X	X		
Copper Corrosion	X	X	X	X	
Oxidation					X
Protection				X	X
Additive Content		X			
Minimum Re-Test Frequency (Months)	48	48	48	48	48
Visual Check Frequency (Months)	12	12	12	12	12
Note 1: The above tests are to be carried out in accordance with the appropriate national specification.					

TABLE B-III (Continued on page B-12)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - LUBRICATING OIL, AIRCRAFT

NATO Code Number	O-148	O-149	O-150	O-153	O-154	O-155
TEST REQUIREMENTS ⁽¹⁾						
Appearance	X	X	X	X	X	X
Pour Point				X		X
Viscosity at 100°C	X	X	X		X	
Viscosity at 40° C				X		X
Viscosity at -40° C		X				
Viscosity at -54° C	X					
Neutralization No (or Total and/or Mineral Acidity)	X	X	X	X	X	X
Precipitation Number	X					
Copper Corrosion				X		X
Foaming Test	X					
Minimum Re-Test Frequency (Months)	48	48	48	348	48	48
Visual Check Frequency (Months)	12	12	12	12	12	12
Note 1: The above tests are to be carried out in accordance with the appropriate national specification.						

TABLE B-III (Continued on page B-13)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - LUBRICATING OIL, AIRCRAFT

NATO Code Number	O-156	O-157	O-159	O-160	O-163
<u>TEST REQUIREMENTS ⁽¹⁾</u>					
Appearance	X	X	X	X	X
Pour Point		X		X	
Viscosity at 100°C	X		X	X	X
Viscosity at 40° C		X			
Viscosity at -54° C					X
Viscosity at -40° C			X		
Neutralization No (or Total and/or Mineral Acidity)	X	X	X	X	X
Precipitation No.		X			X
Oxidation		X			
Foaming Test			X		X
Hydrolytic Stability		X			
Minimum Re-Test Frequency (Months)	48	48	48	48	48
Visual Check Frequency (Months)	12	12	12	12	12
Note 1: The above tests are to be carried out in accordance with the appropriate national specification.					

TABLE B-III (Concluded.)

B-2 TESTS - GREASE, AIRCRAFT

NATO Code Number	G-353	G-354	G-355	G-359	G-361
TEST REQUIREMENTS ⁽¹⁾					
Appearance (including visual oil separation)	X	X	X	X	X
Penetration (worked)	X	X	X	X	X
Working Stability	x	x	x		
Copper Corrosion	X	X	X	X	X
Dropping Point	X	X	X	X	X
Odour	X	X	X	X	X
Oil Separation	X	X	X	X	X
Rust Preventative Properties	X	X			
Minimum Re-Test Frequency (Months)	36	36	36	48	36
Visual Check Frequency (Months)	12	12	12	12	12
Note 1: The above tests are to be carried out in accordance with the appropriate national specification.					

TABLE B-IV(Continued on page B-15)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - GREASE, AIRCRAFT

NATO Code Number	G-363	G-366	G-372	G-382	G-392	G-394	G-395	G-396
TEST REQUIREMENTS ⁽¹⁾								
Appearance (including visual oil separation)	X	X	X	X	X	X	X	X
Penetration (worked)	X	X	X	X	X	X	X	X
Working Stability		X	X	X			X	X
Copper Corrosion	X	X	X	X	X	X	X	
Resistance to Aqueous Solutions	X							
Dropping Point	X	X	X	X	X	X	X	
Fuel Resistance	X							
Oil Separation	X	X	X	X	X	X	X	X
Odour	X	X	X	X	X	X	X	
Rust Preventative Properties		X	X		X		X	
Minimum Re-Test Frequency (Months)	36	36	36	36	36	36	36	36
Visual Check Frequency (Months)	6 ⁽²⁾	12	12	12	12	12	12	12
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.								
Note 2 : G-363 shall be visually examined every 6 months for hardening.								

TABLE B-IV (Concluded on page B-16)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - GREASE, AIRCRAFT

NATO Code Number	G-397	G-398	G-399	G-1350	G-1352	G-1353
TEST REQUIREMENTS ⁽¹⁾						
Appearance (including visual oil separation)	X	X	X	X	X	X
Penetration (worked)	X	X	X	X	X	X
Working Stability					X	X
Dropping Point					X	X
Oil Separation	X	X	X	X	X	X
Copper Corrosion	X	X	X	X	X	X
Odour					X	X
Rust Preventative Properties					X	X
Minimum Re-Test Frequency (Months)	36	36	36	36	36	36
Visual Check Frequency (Months)	12	12	12	12	12	12
Note 1: The above tests are to be carried out in accordance with the appropriate national specification.						

TABLE B-IV (Concluded)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - HYDRAULIC FLUIDS, AIRCRAFT

NATO Code Number	H-515	H-520	H-536	H-537	H-538
TEST REQUIREMENTS ⁽¹⁾					
Appearance	X	X	X	X	X
Flash Point			X		
Pour Point	X	X	X	X	X
Viscosity at 40° C	X	X	X		
Viscosity at - 40° C				X	X
Neutralization No. (or total and/or Mineral Acidity)	X	X	X	X	X
Copper Strip Corrosion	X	X			
Colour			X		
Particulate Contamination	X		X	X	X
Gel Time			X		
Foaming	X	X			
Minimum Re-Test Frequency (Months)	24	36	36	24	24
Visual Check Frequency (Months)	12	12	12	12	12
Note 1: The above tests are to be carried out in accordance with the appropriate national specification.					

TABLE B-V

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - AVIATION SPECIALITY PRODUCTS

NATO Code Number	S-712	S-716	S-717	S-718	S-720	S-722	S-732	S-736	S-737
TEST REQUIREMENTS ⁽¹⁾									
Appearance	X	X	X	X	X	X	X	X	X
Penetration (worked)					X	X		X	
Acidity									X
Corrosion	X		X			X		X	
Ash									
Density									X
Flash Point	X								
Viscosity at 40° C	X								
Total Solids Content			X						
Electric Strength ⁽²⁾								X	
Fineness (particle size)							X		
Insolubility								X	
High Temperature Evaporation and Bleeding ⁽²⁾								X	
pH Value							X		
Minimum Re-Test Frequency (Months)	48		36		48	36	48	60	48
Visual Check Frequency (Months)	12	12	12	12	12	12	12	12	12
Note 1: The above tests are to be carried out in accordance with the appropriate national specification..									
Note 2: To be done if local facilities permit.									

TABLE-B-VI(continued on page B-19)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - AVIATION SPECIALITY PRODUCTS

NATO Code Number	S-738	S-740	S-742	S-743	S-745	S-746	S-747	S-749 ⁽²⁾
TEST REQUIREMENTS ⁽¹⁾								
Appearance	X	X	X	X	X	X	X	
Melting Point				X				
Acidity or Neutralization No	X			X		X	X	
Corrosion		X						
pH Value		X	X		X			
Density	X		X		X	X	X	
Moisture		X						
Residue on Evaporation	X					X	X	
Fineness (particle size)		X						
Water Content					X			
Minimum Re-Test Frequency (Months)	48	48	24	48	24	24	48	24
Visual Check Frequency (Months)	12	12	12	12	12	12 ⁽³⁾	12	6
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification..								
Note 2 : S-749 coatings are to be tested for appearance, adhesion, thermal stability and endurance life if local facilities permit. If local facilities are not available, the material shall be discarded at the end of 24 months storage. A visual check is to be made at the end of the first six months. If separation has occurred and the solids cannot be re-mixed, the product is to be discarded.								
Note 3: S-746 shall be visually examined every 12 months for colour.								

TABLE-B-VI (Continued on page B-20)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - AVIATION SPECIALITY PRODUCTS

NATO Code Number	S-1712	S-1714	S-1716	S-1718	S-1720	S-1724	S-1726
TEST REQUIREMENTS ⁽¹⁾							
Appearance	X	X	X	X	X	X	X
Flash Point	X	X	X	X	X	X	X
Viscosity at 25° C	X	X	X	X	X	X	X
Pour Point	X	X	X	X	X	X	X
Minimum Re-Test Frequency (Months)	60	60	60	60	60	60	60
Visual Check Frequency (Months)	12	12	12	12	12	12	12
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.							

TABLE B-VI (Continued on page B-21)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - AVIATION SPECIALITY PRODUCTS

NATO Code Number	S-1728	S-1732	S-1735 (2)	S-1736	S-1737 (4)	S-1738 (4)
TEST REQUIREMENTS ⁽¹⁾						
Appearance	X	X	X			
Flash Point	X	X				
Viscosity at 25° C	X	X				
Pour Point	X	X				
Minimum Re-Test Frequency (Months)	60	60	-	-	12	12
Visual Check Frequency (Months)	12	12	12	12 ⁽³⁾	12	12
Note 1.: The above tests are to be carried out in accordance with the appropriate national specification.						
Note 2.: Separation layering of constituents of S-1735 shall not be reason for rejection.						
Note 3.: Limit examination to visual check for container damage.						
Note 4.: S-1737 and S-1738 coatings are to be tested for appearance, adhesion, thermal stability and endurance if local facilities permit. If local facilities are not available the material shall be discarded at the end of 12 months storage. A visual check will be made at the end of the first six months. If separation has occurred and the separated solids cannot be re-mixed, the product is to be discarded.						

TABLE B-VI (Concluded on page B-22)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS -AVIATION SPECIALITY PRODUCTS

NATO Code Number	S-1739	S-1744	S-1745	S-1746	S-1747	S-1748	S-1749
TEST REQUIREMENTS⁽¹⁾							
Appearance	X	X	X	X	X	X	X
pH Value ⁽²⁾	X			X			
Freezing Point				X			
Dissolved or Total Solids	X ⁽³⁾	X ⁽⁴⁾					
Acidity		X ⁽⁴⁾	X		X	X	
Density		X	X		X		
Viscosity at 40°C					X		
Water Content			X			X	
Minimum Re-Test Frequency (Months)	24	24	18	24	36	24	24
Visual Check Frequency (Months)	6	6	-	12	12	12	12
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.							
Note 2 : Conductivity values may be reported in lieu of pH for high purity waters on which pH measurement may not be meaningful.							
Note 3 : Electrical conductivity and silica content may be reported in lieu of dissolved solids.							
Note 4: Electrical conductivity (20 ± 5)° C may be reported in lieu of both acidity and total solids.							

TABLE B-VI (Concluded)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - AIRCRAFT CORROSION PREVENTATIVE OILS/COMPOUNDS

NATO Code Number	C-608	C-609	C-610	C-613	C-615
TEST REQUIREMENTS ⁽¹⁾					
Appearance	X	X	X	X	X
Corrosion				X	X
Dispersibility				X	
Flash Point					X
Protection		X	X		
Stability (high and low temperature)		X	X		
Precipitation No.		X	X		
Viscosity at 100°C					X
Minimum Re-Test Frequency (Months)	-	36	48	36	48
Visual Check Frequency (Months)	36	-	-	-	-
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification..					

TABLE B-VII(Concluded on page B-24)

NATO/EAPC UNCLASSIFIED

ANNEX B to
STANAG 3149
(Edition 8)

B-2 TESTS - AIRCRAFT CORROSION PREVENTATIVE OILS/COMPOUNDS

NATO Code Number	C-630	C-634	C-635	C-638
TEST REQUIREMENTS ⁽¹⁾				
Appearance	X	X	X	X
Corrosion		X ⁽³⁾	X	
Flash Point		X	X	X
Total acidity (or Neut No)			X	
Water Displacement		X		
Viscosity at 100° C				X
Viscosity at 40° C			X	
Foaming			X	X
Protection ⁽²⁾			X	X
Lead Corrosion				X
Emulsification Properties	X			
Precipitation No.				X
pH of the Emulsion	X			
Corrosion of the Emulsion	X			
Particulate Contamination			X	
Minimum Re-Test Frequency (Months)	48	48	48	36
Visual Check Frequency (Months)	-	-	-	-
Notes 1 : The above tests are to be carried out in accordance with the appropriate national specification.				
Note 2 : To be done if local facilities permit.				
Note 3 : Copper strip corrosion test.				

TABLE B-VII (Concluded)

B-2 TESTS - PROPELLANTS

NATO Code Number	P-912	P-922	P-925 ⁽³⁾
TEST REQUIREMENTS ^{(1) & (2)}			
Amines		X	
Chloride		X	
Hydrofluoric Acid (HF)	X		
N-Nitrosodimethylamine		X	
Nitric Acid (HNO ₃)	X		
Nitrogen Dioxide (NO ₂)	X		
Solids or Particulate Matter	X	X	
Density	X	X	
UNS-Dimethylhydrazine		X	
Minimum Re-Test Frequency (Months)	3	3	-
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.			
Note 2: Type B2 Tests are required on bulk propellants only.			
Note 3 : No tests required on this product.			

TABLE B-VIII

NAVAL PETROLEUM PRODUCTS

CONTENTS

	<u>PARAGRAPH No</u>
<u>GENERAL</u>	1
<u>BATCHING</u>	2
<u>TESTING REQUIREMENTS</u>	3-4
<u>MINIMUM FREQUENCY FOR TESTING NAVAL PETROLEUM PRODUCTS</u>	5
<u>FILTRATION</u>	6
<u>NAVAL AVIATION PRODUCTS</u>	7
	<u>PAGE</u>
TABLE C-1 - Minimum Requirements for Preparation of Tanker Cargo Tanks for Receiving Petroleum Cargo	C-3 - C-4
TABLE C-II - Minimum Requirements for the Preparation of Barge and Small Motor Vessels For Receiving Petroleum Cargo	C-5
TABLE C-III - Minimum Requirements for Preparation of Tanker Cargo Tanks for receiving Petroleum Cargo Which Has Previously Carried Black Products	C-6
TABLE C-IV - Notes on Critical Contamination Factors and Possibilities	C-7
TABLE C-V - Type B-2 Tests on Naval Fuels and Lubricants	C-8 - C-10

NAVAL PETROLEUM PRODUCTS

GENERAL

1. The minimum common requirements contained in Annex A to this STANAG are to be applied to all naval petroleum products, unless otherwise specified by the detailed requirements laid down in this Annex.

BATCHING

2. Residual and Distillate Fuels need not generally be batched except on first purchase. Lubricants in bulk are not generally batched but the origin and history of packaged stocks must be traceable from the markings on the packages.

TESTING REQUIREMENTS

3. Except on procurement, Type A tests as defined in Annex A Paragraph 34 of this STANAG exclude the following tests for certain naval products:

- a. Residual Fuel: Compatibility and thermal stability tests.
- b. Distillate Fuel: Stability tests.
- c. Diesel Engine Lubricating Oil: Engine tests.
- d. Steam Turbine Lubricating Oil: Oxidation tests.
- e. Hydraulic Oils for use in Submarines: work factor and oxidation tests.

4. Type C tests, as defined in Annex A, Para 34 of this STANAG shall always include for distillate fuel, residual fuel and aviation turbine fuel high flash-point, a flash-point test before transfer to a ship or naval storage. When these fuels have been loaded into fleet replenishment vessels for direct transfer to ships, the flash-point tests shall be undertaken after loading and need not be undertaken before discharge providing that these fuels have been carried in tanks separated by a cofferdam or pump room from fuels of lower flash-point.

MINIMUM FREQUENCY FOR TESTING NAVAL PETROLEUM PRODUCTS

5. Stocks are to be subjected to either a Type A or B-2 Test, at the discretion of the Inspecting Authority, (Paragraph 3 above) at the intervals specified in Table C-V.

In addition all lubricating oils and greases are to be subjected annually to either a Type B-2 or Type C Test at the discretion of the Inspecting Authority, as defined in general terms in Annex A, Paragraph 34 of this STANAG, (see Annex C, Table C-V).

FILTRATION

6. For bulk distillate fuel delivery to warships a filter of 200 microns is required at the point of a delivery. For on-board gas turbines, fuel must meet the cleanliness standard of maximum 10 mg/litre. For that reason a filter/water separator if required. For lubricating oils delivered in bulk to warships a filter of 240 microns (or 80 microns in the case of hydraulic fluid) should be used.

NAVAL AVIATION PRODUCTS

7. The provisions of Annex B apply to Naval aviation petroleum products.

MINIMUM REQUIREMENTS FOR PREPARATION OF TANKER CARGO TANKS FOR RECEIVING PETROLEUM CARGO

Last Cargo Carried		Next Cargo to be Loaded													Black Products	
		Military Cargoes													Residual Fuel	
		White (Clean) Products														
		Military Products	Commercial Products	Colour & Leaded	Leaded Gasoline Aviation	Non-Leaded Gasoline Aviation	Gasoline Automotive	Turbine Fuel Aviation (Gasoline Type)	Turbine Fuel Aviation (Kerosene Type)	Turbine Fuel Aviation (High Flash Point Kerosene Type)	Kerosene	Distillate Fuel				
		Leaded Gasoline Aviation	Leaded Aviation Gasoline	Leaded & Dyed	B	CDE	B	CDE	ACDE	ACDE	ACDE	ACDE	ACDE	ACDE	ACDE	
		Non-Leaded Gasoline Aviation	White Gasoline	Clear	BG	BG	BG	BG	ACDE	ACDE	ACDE	ACDE	ACDE	ACDE	ACDE	
		Gasoline Automotive	Motor Gasoline	Leaded & Dyed	B	CDE	BG	BE	BE	ACDE	ACDE	ACDE	ACDE	ACDE	ACDE	
	White (Clean) Products	Turbine Fuel Aviation (Gasoline Type)		Pale Straw Colour	BE	EE	BE	BG	ACDE	ACDE	ACDE	ACDE	ACDE	ACDE	ACDE	
		Turbine Fuel Aviation (Kerosene type)		Pale Straw Colour	BE	EE	BE	B	BG	BE	B	BE	BE	BE	BE	
		Turbine Fuel Aviation (High Flash Point Kerosene Type)		Straw Colour	BE	EE	BE	B	B	BG	BG	B	B	B	B	
		Kerosene	Water White or Standard White Kerosene	Clear	ABE	A3E	A3E	ABE	B	E	BG	ABE	B	B	B	
		Distillate Fuel	Dyed Kerosene Gas Oil	Dyed Straw Colour	ACDE	ACDE	ACDE	CDE	CDE	CDE	ACDE	ACDE	ACDE	ACDE	ACDE	

Note 1 : Excluding F-44 and lubricating oil, clean product may be carried immediately following grain cargo provided the last cargo prior to grain service was clean.

Note 2 : When the next cargo to be carried is a white oil, and water washing is carried out, this should be with fresh water as far as possible.

Note 3 : Where the vessel has an approved lining to the product tank, the national authority may reduce the cleaning requirement set out above, providing the procedure adopted achieves the same level of cleanliness to the product tank. The procedure used shall not damage or impact on the integrity of the tank lining.

Note 4 : Explanation of symbols used in this table see pages C-4

Table C-I (Concluded on page C-4)

EXPLANATION OF SYMBOLS USED IN TABLE C-I FOR TANK CLEANING OPERATIONS

- A. Blow Out Heating Coils and Steam Smothering Lines. Heating coils should be blown out thoroughly with steam or hot water. Cargo tank steam smothering lines should be blown out with steam one at a time. Normally the above should be done before the operations outlined in B and C below are performed
- B. Bottom Wash and Airing of Cargo Tanks. Tank bottoms should be washed from deck with a hand hose to wash all debris and loose sediment from the tank, preferably with tank hatch open to perform a thorough job. Tanks should then be aired out, with windsails if necessary. Strainers for cargo and stripping pumps being used for removal of washings should be cleaned frequently to prevent clogging. To prevent accumulation of sediment and plugging of limber holes, muck out each tank at least every other trip by following a definite ballasting pattern, when the ship is carrying black cargo. Also, enough clean ballast should be used in each tank before commencing a bottom wash so as to cover the bottom shell longitudinally.
- C. Clean Vent Lines Machine Wash and Gas Free Cargo Tanks. (See sub para if tanks have an enamel or similar coatings). Cargo tank vent lines should be flushed out with hot water. Vent line relief valves should be closed and vent lines filled with water, after which valves should be opened one at a time to flush each individual line into its respective cargo tank, then all end flanges should be removed and the entire vent line system allowed to drain. Cargo tanks should be washed with efficient water jet washing machine. Tank tops should be opened and windsails used if necessary, to gas free the tanks to allow personnel to enter each tank to hand hose tank bottoms and remove loose scale and sediment. Particular attention should be given to tanks that previously contained products that were dyed after loading, as some dye powder may adhere to the bulkheads and underdecks and become impregnated in scale above the liquid level. If not properly removed by thorough washing, this residual dye will contaminate subsequent white product cargoes. Upon completion, strip all tanks and lines. Flush all vent lines between clean cargoes.
- Where tanks have enamel or similar coatings clean and gas free by means of approved gas extractors. **THE USE OF HOT WATER OR STEAM IS FORBIDDEN.**
- D. Remove Sediment, Sludge and Scale. All loose sediment, sludge and scale should be removed from tank bottoms, as traces of oil may remain therein even after washing. Tank bottoms should be hand hosed in conjunction with the removal of sediment, sludge and scale.
- E. Flush Cargo Pipelines and Pumps, Clean pump Strainers. Cargo pipelines and pumps should be cleaned by pumping clean water through each pump and pipeline for a minimum of 20 minutes. Special attention should be given to removing oil that may remain at low spots or bypasses in the pipeline and in valves and strainer boxes. Main stripper pumps should be used simultaneously with crossover and bypass valves which should be opened and closed several times while flushing. Strainers for all cargo pumps should be cleaned frequently. Cargo lines and pumps should be flushed before commencing tank cleaning. Drain all cargo lines on completion of flushing and dispose of all drainage liquids before loading. The hatches must be properly gasketed and form tight closures to prevent the entrance of water.

Table C-I (Concluded)

MINIMUM REQUIREMENTS FOR THE PREPARATION OF BARGE AND SMALL MOTOR VESSELS FOR RECEIVING PETROLEUM CARGO

CHANGE FROM	TO	Gasoline Aviation and Automotive (Leaded)	Turbine Fuel Aviation (Gasoline Type), Automotive Gasoline Unleaded	Turbine Fuel Aviation (Kerosene Type), Kerosene	Middle Distillates	Heavy Distillates	Lubricating Oil
Gasoline Aviation and Automotive(Leaded)	A	A	A	B	B	B	B
Turbine Fuel Aviation (Gasoline Type), Automotive Gasoline Unleaded	A	A	A	B	B	B	B
Turbine Fuel Aviation (Kerosene Type), Kerosene	A	A	A	A	A	A	B
Middle Distillates	A	A	A	A	A	A	A
Heavy Distillates	No Load	No Load	No Load	No Load	D	A	No Load
Lubricating Oils	C	C	D	D	D	A	A

Note 1: Charge Of Grade Procedure
 Explanations of symbols used for tank cleaning operations see page C-4

Note 2: Where the vessel has an approved lining to the product tank, the national authority may reduce the cleaning requirement set out above, providing the procedure adopted achieves the same level of cleanliness to the product tank. The procedure used shall not damage or impact on the integrity of the tank lining.

TABLE C-II

MINIMUM REQUIREMENTS FOR PREPARATION OF TANKER CARGO TANKS FOR RECEIVING PETROLEUM CARGO WHICH HAS PREVIOUSLY CARRIED BLACK PRODUCTS

Last Cargo Carried	Next Cargo to be Loaded											Black Products
	Military Cargoes											
	White (Clean) Products											
	Commercial Products	Colour & Leaded	Leaded Gasoline Aviation	Non-Leaded Gasoline Aviation	Gasoline Automotive	Turbine Fuel Aviation (Gasoline Type)	Turbine Fuel Aviation (Kerosene Type)	Turbine Aviation (High Flash Point Kerosene Type)	Kerosene	Distillate Fuel	Residual Fuel	
Black Products	Commercial Diesel Oil Marine Diesel Fuel	Black or Dark	F	F	F	F	F	F	F	F	ABE	
Bunker Fuel Oil	Residual Fuel	Black	F	F	F	F	F	F	F	F	AE	
	Crude Oil	Black	F	F	F	F	F	F	F	F	BG	
	Molasses Linseed Oil Waxes Cotton Seed Oil & Tar			H-I (1)	H-I (1)	H-I (1)	H-I (1)	H-I (1)	H-I (1)	H-I (1)	H (1)	

Note 1 : Excluding F-44 and lubricating oil, clean product may be carried immediately following grain cargo provided the last cargo prior to grain service was clean.

Note 2 : When the next cargo to be carried is a white oil, and water washing is carried out, this should be with fresh water as far as possible.

Note 3 : EXPLANATION OF SYMBOLS USED FOR TANK CLEANING OPERATIONS

F. Conversion from Black Oil Products to White (Clean) Products. The procedure is necessarily long to avoid contamination of white (clean) products. Wherever possible, professional assistance should be obtained. The general method advised is:

Carry out operations A-C-D-E. (see TABLE C-1) These steps shall be followed by a careful inspection to determine whether the tank appears to be sufficiently clean to receive the desired product. Samples of rust or scale will be taken from selected cargo tanks, pulverized and 1 gram added to 100 ml of the product to be loaded. After staking the mixture vigorously for at least one minute, it shall be filtered free of sediment and examined for colour, corrosion and residue in accordance with the requirements of the specification of product to be loaded. Then flush pumps and pipe systems with the white product which it is intended to carry. If this, on test, is up to specification, the cleaning has been successful. If the specification test is not met, there is a choice between repeating the cleaning process and carrying a succession of clean cargoes in the order diesel, gasoline, cleaning before and after each one. Flush with the intended product and test to specification.

G. Where B, G is specified, B is necessary only after several voyages when the same or similar cargoes are carried consecutively. Accumulations of bottom scale or sediment should be removed on the ballast trips every two or three voyages, or more often as necessary.

H. Vessels which last transported linseed oil, cotton-seed oil, tar, wax, molasses or other products which possibly would cause detrimental contamination will be machine washed and, if necessary, chemically cleaned as prescribed by the technical authority before being considered for a military cargo.

I. Vessels that last carried product which obviously or probably would cause contamination of next cargo, will be rejected outright unless cleaned in accordance with H and in addition have carried after cleaning, at least 3 cargoes for Aviation Fuels and 2 cargoes for all other fuels, of white (clean) commercial products.

Table C-III

NOTES ON CRITICAL CONTAMINATION FACTORS AND POSSIBILITIES

NEXT CARGO	<u>LAST CARGO AND EFFECT OF CONTAMINATION</u>
GASOLINE	<p><u>Distillate fuel, residual fuel, lube oil or whale oil:</u> As little as one-third of a barrel of any of these can contaminate 8,000 barrels of gasoline by increasing gum content.</p> <p><u>Dyed Kerosene:</u> Some commercial kerosenes are dyed after loading and dye powder adhering to bulkheads and impregnated in scale above liquid level can throw subsequent white products off-test with respect to colour.</p>
KEROSENE	<p><u>Gasoline:</u> Small quantities will throw flashpoint off-test.</p> <p><u>Residual fuels:</u> Very small quantities will throw colour off-test. * See dye powdered kerosene under gasoline above.</p>
TURBINE FUEL AVIATION	<p><u>Distillate Fuel:</u> Small quantities will throw the freezing point off-test.</p> <p><u>Residual Fuel:</u> Jet fuels are good solvents and small quantities of residual fuel will throw gum content off-test.</p> <p><u>Gasoline:</u> Small quantities will throw flashpoint and explosivity of high flashpoint aviation turbine fuels off-test.</p>
DISTILLATE FUEL	<p><u>Gasoline, Aviation Turbine Fuel and Kerosene:</u> Small quantities will throw flash-point off-test.</p> <p><u>Residual Fuel:</u> Small quantities of some residual fuels will precipitate sludge in distillate fuel. Minute traces of residual fuel will reduce the water separation ability of distillate fuels.</p>
RESIDUAL FUEL	<p><u>Gasoline:</u> Very small quantities will throw flashpoint and explosivity off-test.</p>
LUBRICATING OILS	<p>Special precautions are necessary in cleaning prior to loading bulk lubricating oils. Such cleaning should be accomplished under technical advice.</p>

TABLE C-IV

B-2 TESTS REQUIRED ON NAVAL FUELS

	Residual Fuels	Distillate Fuel Oils
NATO Code Number	F-77	F-75 F-76
TEST REQUIREMENTS (1)		
Appearance		X
Colour		X
Density	X	X
Flash Point	X	X
Viscosity	X	
Pour Point	X	
Total Acidity		
Total Base Number		
Carbon Residue		X (3)
Sulphated Ash		
Emulsification Properties		
Water Test	X	X
BS &W		X
Water Separation		X
Water Reaction		X
Cloud Point		X
Minimum Retest Frequency (Months)	36	12(2)
Visual Check Frequency (Months)	12	12
Note 1 : The above tests are to be carried out in accordance with the appropriate national specifications.		
Note 2 : Under Arctic storage conditions 36 months.		
Note 3 : Test only required if colour fails.		

TABLE C - V (Continued on page C-9)

B-2 TESTS REQUIRED ON NAVAL LUBRICANTS

	Steam Turbine Lub Oils	Diesel Engine Lub Oils	Comp Marine Engine Oils	Steam Engine Cyl Oils	Refrigerant Equip Lub Oils
NATO Code Number	O-240 O-249 O-250	O-274 O-276 O-278	O-254	O-252 O-258	O-283 O-285 O-290
TEST REQUIREMENTS (1)					
Appearance	X	X	X	X	X
Colour	X				
Density					
Flash Point					
Viscosity	X	X	X	X	X
Pour Point					
Total Acidity			X		X (O-285 only)
Total Base Number		X			
Carbon Residue					
Sulphated Ash		X			
Emulsification Properties	X		X		
Water Test	X			X	
BS &W	X			X	
Sediment	X	X			
Foam Characteristics					
Minimum Retest Frequency (Months)	60(2)	60(2)	60(2)	60(2)	60(2)
Visual Check Frequency (Months)	12	12	12	12	12
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.					
Note 2 : Lubricating Oil in bulk 36 months					

TABLE C-V (Concluded on page C-10)

B-2 TESTS REQUIRED ON NAVAL HYDRAULIC FLUIDS , GEAR OILS AND GREASES

	Hydraulic Fluids	Fire Resistant ⁽³⁾ Hydr Fluids	Gear Lubricating Oil	Greases
NATO Code Number	H-572 H-573 H-575 H-576	H-579 H-580	O-262	G-450 G-460
TEST REQUIREMENTS (1)				
Appearance	X	X	X	X
Colour				
Density		X		
Flash Point				
Viscosity	X		X	
Pour Point				
Total Acidity	X	X (H-580 only)	X	
pH		X (H-579 only)		
Penetration (worked)				X
Steel Corrosion			X (4)	X
Copper Corrosion			X	X
Sediment	X		X	
Foam Characteristics			X	
Oil Separation				X
Minimum Retest Frequency (Months)	60 ⁽²⁾	60 ⁽²⁾	60 ⁽²⁾	48
Visual Check Frequency (Months)	12	12	12	12
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.				
Note 2 : Lubricating oils in bulk : 36 months				
Note 3 : Additional inspection may be necessary to check for deterioration of containers of aqueous hydraulic fluids.				
Note 4 : Test only required if copper corrosion fails.				

TABLE C-V (Concluded)

ARMY PETROLEUM PRODUCTS

CONTENTS

	<u>PARAGRAPH NO</u>
<u>GENERAL</u>	1
<u>DISPENSING FROM KERBSIDE PUMPS</u>	2 - 4
<u>PIPELINE TRANSFERS</u>	5
	<u>Page</u>
TABLE D-I - Minimum Frequency for Testing Army Petroleum Products	D-3
TABLE D-II - Standard of Filtration	D-4
TABLE D-III - Type B-2 Tests on Army Lubricants and Special Products	D-5 - D-12

ARMY PETROLEUM PRODUCTS

GENERAL

1. The minimum common requirements contained in Annex A to this STANAG are to be applied to all army petroleum products, unless otherwise specified by the detailed requirements laid down in this Annex.

DISPENSING FROM KERBSIDE PUMPS

2. The provisions for bulk storage tanks as detailed in the general section shall be applicable to tanks feeding kerbside pumps with the exception of Annex A, paragraph 20.

3. Filters of a suitable type are to be fitted as near as practicable to the end of all outgoing lines (Annex D, Table D-II). They are to be inspected and cleaned as necessary.

4. In any installation or equipment likely to be out of service for four months or more, pumps, fans, motors etc are to be given adequate protection either in place or by transfer to store. Tanks are to be isolated, cleaned and dried and protected internally with a suitable water displacing fluid.

PIPELINE TRANSFERS

6. When products are transferred through a common pipeline. Type B-1 tests as defined in Annex A, paragraph 34 of this STANAG are required.

MINIMUM FREQUENCY FOR TESTING ARMY PETROLEUM PRODUCTS

Dormant stocks of POL products are to be sampled and submitted to Type A or Type B-2 tests (Annex A, para 34), whenever stocks are suspected of being off-specification, or with the minimum frequency indicated below:

Product	Table	Minimum frequency of Testing	
		Bulk	Packaged
Gasoline Automotive (F-57, F-67)	A-III	24 months	12 months
Diesel fuels (F-54, F-65)	A-IV	24 months	12 months
Kerosene (F-58)	A-IV	24 months	12 months
Lubricating oils, greases, hydraulic fluids, cutting fluids, dry-cleaning solvent etc.	See Entries against each product in Annex D, Table D-III. See notes, 1, 2, 3 below.		
Note 1 : Under condition of arctic storage, inspection of motor fuels and lubricants may be made every three years.			
Note 2 : Under conditions of tropical storage, inspection of motor fuels and lubricants shall be made more frequently than indicated in this Table and Table D-III.			
Note 3 : Where a "visual check" is specified in Table D-III, the visual check shall be carried out by suitably trained personnel and shall consist of inspection of a sample of the product taken from the container. In the case of liquid products, a bottom sample shall first be taken for examination of sediment or separation of components, then the container shall be thoroughly agitated and a second sample taken for general examination (a bottom samples not required from containers of capacity 5 litres or less). Containers shall be inspected at the same time for damage, leakage, rust and corrosion. In the case of hermetically sealed products which are liable to deteriorate when opened, these products shall after inspection, be used immediately or disposed of as authorised.			

TABLE D-1

STANDARD OF FILTRATION

Product	Issues into containers (Packed stocks)	Issues into equipment
Gasoline Automotive	150 microns	150 microns (1)
Diesel Fuel	150 microns (2)	150 microns (1 and 2)
Hydraulic fluid	To be micronically filtered on manufacture (3)	1. When the fluid has been micronically filtered into small hermetically sealed containers it need not be refiltered before dispensing. 2. When the above does not apply the fluid should be filtered into the equipment to at least 80 microns
Note 1 : Applicable to issue from kerbside pumps only.		
Note 2 : Not applicable when ambient temperatures approximate the cloud point.		
Note 3 : This shall be a filter capable of cutting off a minimum 96.5% by weight of all solid contaminants and/or particles of size 5 microns or larger		

TABLE D-II

B-2 TESTS REQUIRED ON ARMY LUBRICANTS AND SPECIAL PRODUCTS

	IC Engine Oils	E P Gear Lubricants	Open Gear Lubricants
NATO Code Number	O-182 O-1176 O-183 O-1178 O-236 O-1179 O-237 O-1236 O-238 O-239	O-186 O-226 O-228	O-203
<u>TEST REQUIREMENTS(1)</u>			
Appearance	X	X	X
Copper Corrosion		X	
Viscosity 40°C	X(2)		
Viscosity 100°C	X	X	X
Sulphated Ash	X	X	
Foam Stability	X	X	
Minimum Re-test Frequency (Months)	60	48	48
Visual Check Frequency (Months)	12	12	12
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.			
Note 2 : Determine this viscosity on multi-grade engine oils only.			

TABLE D-III(Continued on page D-6)

B-2 TESTS REQUIRED ON ARMY LUBRICANTS AND SPECIAL PRODUCTS

	Compound Lubricating Oils	Machinery Oils	Insulating Oils
NATO Code Number	O-208	O-134 O-196	S-756
<u>TEST REQUIREMENTS</u> (1)			
Appearance	X	X	X
Flash Point			X
Copper Corrosion		X	X
Viscosity 40°C		X	X
Viscosity 100°C	X		
Saponification Value	X		
Neutralisation Number			X
Dielectric Strength			X
Minimum Re-test Frequency (Months)	36	48 (O-134 60 mths)	48
Visual Check Frequency (Months)	12	12	-
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.			

TABLE D-III (Continued on page D-7)

B-2 - TESTS REQUIRED ON ARMY LUBRICANTS AND SPECIAL PRODUCTS

	Graphited Lubricating Oils	Semi-fluid Lubricating Compounds	Two-stroke Gasoline Eng Lub Oils
NATO Code Number	O-218	O-158 O-204	O-1177
<u>TEST REQUIREMENTS(1)</u>			
Appearance	X	X	X
Copper Corrosion	X	X	X
Viscosity 40°C	X		X
Penetration (worked)		X	
Neutralisation (acidity)		X	
Odour		X	
Minimum Re-test Frequency (Months)	36	24	36
Visual Check Frequency (Months)	12	12	12

Note 1 : The above tests are to be carried out in accordance with the appropriate national specification .

TABLE D-III (Continued on page D-8)

B-2 - TESTS REQUIRED ON ARMY LUBRICANTS AND SPECIAL PRODUCTS

	IC Engine Preservative Oils	Multi-purpose Preservative Oils	Armament Lub. Clean (Pres) Oils
NATO Code Number	C-640 C-642	O-190 O-192	O-194 S-758 S-761
<u>TEST REQUIREMENTS</u> (1)			
Appearance	X	X	X
Flash Point	X		X (Not O-194)
Copper Corrosion		X	
Viscosity 40°C		X	X
Viscosity 100°C	X		X
Viscosity (low temp)			X
Load Carry Capability			2
Pour Point			X
Sulphated Ash	X		
Foam Stability	X		
Minimum Re-test Frequency (Months)	48	48	36
Visual Check Frequency (Months)	12	12	12
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.			
Note 2 : For S-758 and S-761 only; if Load Carrying Capability test is required in spec.			

TABLE D-III (Continued on page D-9)

B-2 - TESTS REQUIRED ON ARMY LUBRICANTS AND SPECIAL PRODUCTS

NATO Code Number	Cutting Fluids		Hydraulic Oils (Petroleum based)	Hydraulic/ Brake Fluids (Synthetic)
	O-214	O-216	H-540 H-544	H-542 H-547
<u>TEST REQUIREMENTS</u> ⁽¹⁾				
Appearance	X	X	X	X
Flash Point		X	X	X
Copper Corrosion		X	X	
Viscosity 40°C		X	X	X
Viscosity 100°C		X		
Viscosity (low temp)			X	X
Odour	X	X		
pH				X
Emulsification	X			
Foam Tendency			X	
Minimum Re-test Frequency (Months)	48	48	36 (H-540 60 mths)	48
Visual Check Frequency (Months)	12	12	12	12

Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.

TABLE D-III (Continued on page D-10)

B-2 - TESTS REQUIRED ON ARMY LUBRICANTS AND SPECIAL PRODUCTS

	Dry Cleaning Solvents	Antifreezes	Greases	
			G-412	G-403 G-414 G-421
NATO Code Number	S-752 S-753 S-760	S-750 S-757 S-759		
<u>TEST REQUIREMENTS</u> ⁽¹⁾				
Appearance	X	X	X	X
Flash Point	X			
Copper Corrosion	X		X	X
Distillation	X			
Drop Point			X	
Penetration (worked)			X	X
Oxidation				X
Oil Separation			X	X
pH/Free Acidity		X (2)	X	
Reserve Alkalinity		X(2)		
Freezing Point 50/50 Water		X		
Minimum Re-test Frequency (Months)	48	48	36	36 ⁽³⁾
Visual Check Frequency (Months)	12	12	12	12
Note 1 : The above tests are to be carried out in accordance with the appropriate national specification.				
Note 2 : If applicable.				
Note 3 : US 24 months.				

TABLE D-III (Continued on page D-11)

B-2 - TESTS REQUIRED ON ARMY LUBRICANTS AND SPECIAL PRODUCTS

Product	Corrosion Preventative Compounds		
	C-614 C-620 C-632	C-627 C-628 C-633 C-654	C-629
<u>TEST REQUIREMENTS⁽¹⁾</u>			
Appearance	X	X	X
Copper Corrosion	X	X	
Film Appearance	X		X
Drying Rate	X		X
Melting Point		X	
Stability of Wax Dispersion	X	X	
Ash	X		
Penetration (worked)		X	
Minimum Re-test Frequency (Months)	48	48	48
Visual Check Frequency (Months)	12	12	12

Notes 1 : The above tests are to be carried out in accordance with the appropriate national specification.

TABLE D-III (Concluded on page D-12)

B-2 TESTS REQUIRED ON ARMY LUBRICANTS AND SPECIAL PRODUCTS

	Automatic Transmission Fluids	Fuel Additives
NATO Code Number	H-548	S-1750
<u>TEST REQUIREMENTS⁽¹⁾</u>		
Appearance	X	X
Flash Point		X
Copper Corrosion	X	
Viscosity 40°C		X
Viscosity 100°C	X	
Water Content	X	
Minimum Re-test Frequency (Months)	48	24
Visual Check Frequency (Months)	12	12
Note 1: The above tests are to be carried out in accordance with the appropriate national specification.		

TABLE D-III (Concluded)

RATIFICATION AND IMPLEMENTATION DETAILS
STADE DE RATIFICATION ET DE MISE EN APPLICATION

N A T I O N	NATIONAL RATIFICATION REFERENCE DE LA RATIFICATION NATIONALE	NATIONAL IMPL- EMENTING DOCUMENT NATIONAL DE MISE EN APPLICATION	IMPLEMENTATION/MISE EN APPLICATION					
			INTENDED DATE OF IMPLEMENTATION/DATE PREVUE POUR MISE EN APPLICATION			DATE IMPLEMENTATION WAS ACHIEVED/DATE REELE DE MISE EN APPLICATION		
			N M A E V R Y	A T R E M R Y R E	AIR	N M A E V R Y	A T R E M R Y R E	AIR
(1)	(2)	(3)	(3)	(3)	(3)	(3)	(3)	
BE	JSO-G/POL/99 34925 of/du 27.8.99	STANAG	1.00	1.00	1.00			
CA	2441-3149(OETES) of/du 22.9.99	C-02-005-001/AM-003				0.00	0.00	0.00
CZ	6/2-21/2000-1419 of/du 4.10.00	STANAG		10.03	10.03			
DA	FKO MAM3 9404225-009 of/du 19.10.99	STANAG	3.02	3.02	3.02			
FR*	001116/DEF/EMA/OL4 of/du 17.5.01	STANAG	3.02	3.02	3.02			
GE	BMVg-Fü516-Az03-51-60 of/du 30.4.02	STANAG	1.03	1.03	1.03			
GR	F.073/AD609606/D384/12-09-2000/GEA/G1 of/du 14.12.2000	STANAG	3.02	3.03	3.02			
HU								
IT								
LU								
NL								
NO	MAS-69/00/FO/LST/BEE ST 3149 11.5.00	STANAG	3.03	3.03	3.03			
PL								
PO								
SP								
TU								
UK	SMG/217400/7/2 of/du 16.11.99	STANAG	11.00	11.00	11.00			
US	3149/PRTG/1/31/01 of/du 31.1.01	MIL-STD-3004				1.01	1.01	1.01

* See reservations overleaf/Voir reserves au verso (4)

RESERVATIONS

FR: Reservations concerning the frequency of periodic checks of the product:

NATO PRODUCT CODE	FREQUENCY OF CHECKS (IN MONTHS)	
	As listed in STANAG 3149	France's reservations
AIR		
F-34	12	18 (12 in the tropics)
F-35	12	18 (12 in the tropics)
F-44	12	18 (12 in the tropics)
O-162	Not included in STANAG 3149	48
G-359	36	48
C-615	36	None
C-630	48	None
C-634	48	None
S-737	48	None
S-738	48	None
S-740	48	None
S-743	48	None
NAVY		
F-75	12	24
F-76	12	24
ARMY		
F-63	Not included in STANAG 3149	24
C-620	48	None
C-629	48	None
S-752	48	None

- Reservations regarding the way in which packaging is labelled: French packaging does not include stock numbers, contract number, manufacturer's name (except for the Navy) or the date of the periodic separation.
- Reservations regarding the visual inspections: France does not perform the visual inspections listed in tables B-III, B-IV, B-V, B-VI, B-VII, B-VIII and D-III.